Title:

Hello 10 t/ha! Moving towards varieties of winter cereals better suited for irrigation.

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In a nutshell

- Trials of wheat, durum, barley and triticale, in 2007 achieve 10 t/ha.
- Trial management demonstrates grain protein levels of 11% or greater are achievable.
- Choosing the best from current varieties to maximise irrigation opportunities.

This article will focus on using the results from the 2007 trials to help select winter cereal varieties best suited for irrigation and dryland production. The ICF project "High yielding genotypes of winter cereals for irrigated regions of south east Australia" achieved outstanding results. Due to the constraints of water availability for full irrigation we have combined these results with the National Variety Trials predicted yields to assist decisions about the best management strategies for 2008 crops and planning for 2009.

Yield - Irrigated versus Dryland

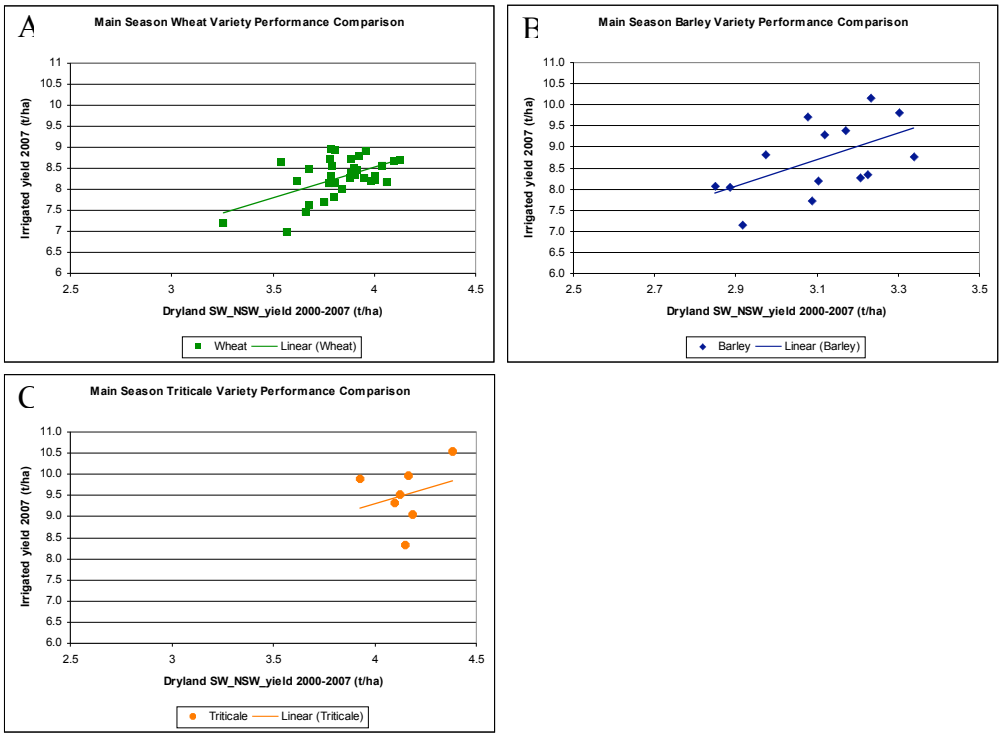
The 2007 trials showed that very high yields under full irrigation are attainable in our region. There are breeders' lines which have yield potential well beyond that of the currently available varieties. Some examples of this are Barley 10.832 t/ha (WB261), Durum 11.518 t/ha (WID22221), Triticale 12.982 t/ha (TSA0222) and Wheat 11.976 t/ha (WW13602) at Yanco.

However how confident can you be that your variety will perform if it is irrigated? This question can be answered in part by comparing the 2007 irrigated performance of varieties with their dryland performance in South Western NSW over the last seven years. Figure 1 shows three crops barley, wheat and triticale, and indicates if you are growing a variety that is high yielding in the NVT analysis it also performed well in the irrigated trials relative to the other released varieties. Figure 1 shows this by the positive slope between dryland and irrigated trials. It was not possible to compare the Durum varieties because the NVT analysis was not available. One factor that may be influencing the positive relationship in Figure 1 is that a proportion of the trials in the NVT analysis over the last seven years have received some irrigation.

This shows that some of the top dryland varieties with intensive management have the potential to achieve high yields for example Yenda 11.804 t/ha, Kosciuszko 10.524 t/ha and Fleet 8.768 t/ha. These are only the varieties that have been included in the NVT analysis for SW-NSW 2000-2007. The irrigated trials showed other varieties not in the NVT analysis such as Hindmarsh (Barley) and Tobruk (Triticale) can also perform when irrigated. However, others such as Stirling, Tahara and Sunvale even under optimal conditions in 2007 performed poorly. Thus management strategies and expectations of response to irrigation and nitrogen need to be variety specific.

The management of the trials was based on the crop checks developed for the '8 ton Club' by John Lacy and modified for achieving 10 ton/ha. The nitrogen budget and timing of irrigations were critical to achieving our results. The total nitrogen budget was 300 kg/ha, comprised of 80 kg/ha in the soil, 42, 68 and 110 kg/ha, applied at sowing, 1st top dressing (Zadocks 31), 2nd top dressing (Zadocks 41-45) respectively. Irrigations consisted of pre-watering 1.7 Megalitres/ha and 5 spring irrigations (1 x 0.8 and 4 x 0.7 Ml/ha).

Figure 1: Comparison of irrigated yield performance 2007 with NVT dryland main season performance 2000-2007of varieties grown in South West NSW, A- Wheat, B- Barley and C- Triticale. Comparisons are based on separate trials and are not an analysis of trials. Note, a number of the dryland trials over the last seven years in SW-NSW have received limited irrigated.



Lodging

Lodging was variable between the winter cereals and amongst the varieties. The best performers for each crop were Yenda, Arivato, Capstan and Jaywick. These varieties appear to be suitable for more intensive management. Table 2 provides the lodging score for a selection of the varieties under irrigation in 2007.

Grain Quality

One of the objectives of the trials is to produce grain suitable for receival into the Australian Hard (AH) segregation for bread wheats. The results from 2007 in Figure 2, Table 1 and Table 2 show this was achieved. Figure 1 illustrates the relationship of grain yield versus grain protein for wheat, barley and durum. As expected there is a negative trend of grain protein with yield. Our target grain protein was 11% at 10 t/ha yield, the minimum grain protein value observed in the tested samples was 10.7% for a durum sample. The trial averages in Table 1 show the late application of nitrogen was sufficient to increase grain protein. The levels achieved

show for wheat and durum it is possible produce grain suitable to be accepted into high quality grades even at these very high yield levels.

The barley samples analysed showed the nitrogen regime was too high for this crop. This resulted in the very high grain protein (average 14.81%) and that the retention percentage was lower than 95-90 %. These results imply considerable savings on late application of nitrogen for barley can be made.

Figure 2: Irrigated yield 2007 versus percent grain protein at Yanco for A- Wheat, B- Barley and C- Triticale. The total nitrogen budget consisted of 300 kg/ha, comprised of soil 80, sowing 42, 1st top dressing (Zadocks 31) 68, 2nd top dressing (Zadocks 41-45) 110 kg/ha. Irrigations consisted of pre-watering 1.7 Megalitres/ha, spring irrigations 1 x 0.8 and 4 x 0.7 Ml/ha.

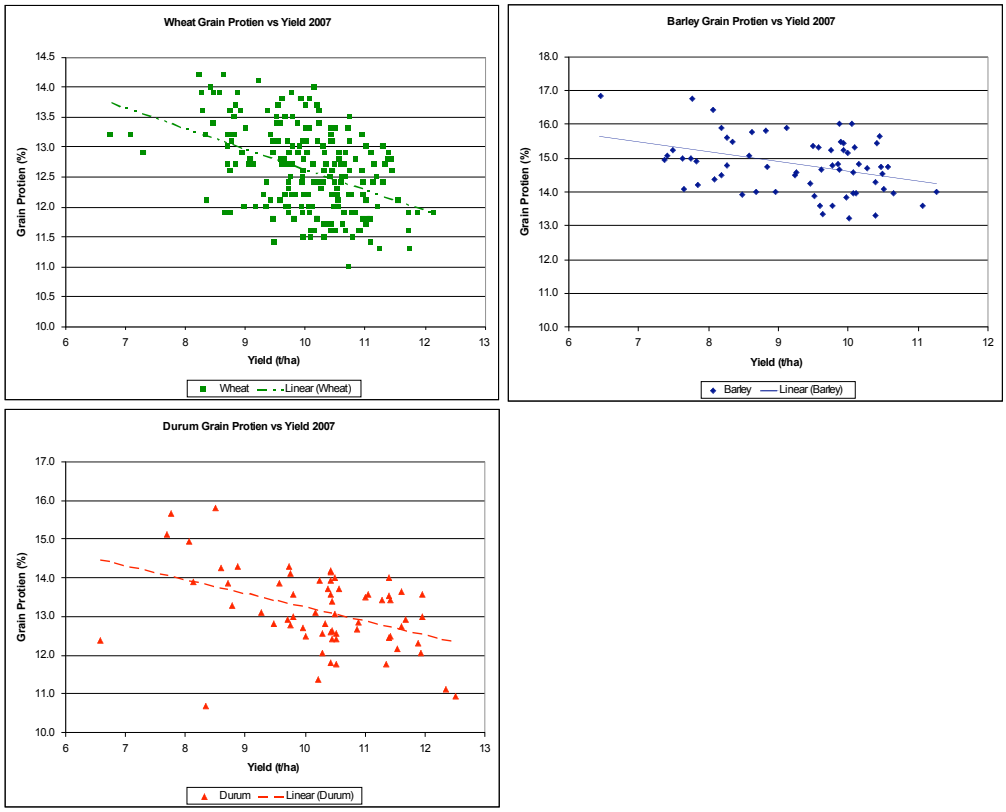


Table 1. The trail averages for the receival standards for the 2007 irrigated trials at Yanco. Numbers in brackets () are standard deviation of the mean.

		Yanco 2007			
		Wheat	**Barley**	**Durum**	**Triticale**
Trial Averages	**Screenings (%)**	**2.9** (1.2)	**3.8** (2.5)	**7.7** (2.3)	**6.6** (1.7)
	Black Point (%)	**0.4** (0.5)		**0.3** (0.4)	
	Retention (%)		**87.7** (6.8)		
	Test Weight	**78.6** (1.6)	**68.7** (1.6)	**80.1** (1.5)	**71.8** (2.8)
	1000 kernel wt (g)	**44.3** (4.6)	**47.3** (4.0)	**51.9** (4.6)	**49.2** (4.7)
	Protien (%)	**12.62** (0.7)	**14.81** (0.8)	**13.16** (1.0)	

Table 2: Selection of a number of the top performing dryland varieties in SW-NSW for wheat, durum, barley and triticale. Their 2007, Yanco irrigated yield (t/ha), lodging (1-9), grain protein achievement %, Screenings %, Black point %, Test weight, 1000 kernel weight and retention.

	Variety	Yield	Lodging	Screenings	Black Point	Retention	Test Weight	1000 kernal wt	Grain Protien
Barley	BULOKE	8.272	6.0	5.3		81.8	66.7	46.7	14.5
	CAPSTAN	10.152	1.0	5.6		80.5	66.9	46.4	14.6
	DASH	9.814	4.5	2.2		89.8	67.3	39.7	13.3
	FLEET	8.768	8.3	2.4		91.0	67.1	56.5	14.2
	KEEL	8.351	7.5	4.3		90.6	68.4	49.5	14.8
	LSD 5%	1.119	2.2	1.5		4.7	1.4	2.2	0.5
Durum	ARIVATO	10.895	1.5	6.7	0.5		81.9	54.3	13.4
	BELLAROI	10.282	5.6	7.6	0.1		79.7	51.0	13.6
	GUNDEROI	9.817	7.9	7.7	0.2		80.5	44.9	12.9
	TAMAROI	10.532	7.0	9.2	0.2		80.5	52.3	12.3
	WOLLAROI	10.050	7.1	7.3	0.3		80.5	47.4	13.4
	YALLAROI	10.793	8.4	5.3	0.3		79.7	53.1	12.3
	LSD 5%	1.426	2.2	1.5	0.5		1.4	2.2	0.5
Triticale	EVEREST	9.948	7.6	7.0			75.6	49.9	
	KOSCIUSZKO	10.524	6.9	6.5			74.2	50.8	
	SPEEDEE	9.506	6.8	8.7			70.4	54.7	
	TAHARA	8.307	8.3	6.3			69.5	46.9	
	TICKIT	9.030	7.7	5.8			69.9	45.4	
	LSD 5%	1.662	1.8	1.5			1.4	2.2	
Wheat	BARHAM	9.741	3.8	2.0	0.0		76.7	42.9	12.0
	BOLAC	10.491	3.8	3.3	1.0		77.8	35.7	12.8
	DERRIMUT	10.594	6.5	2.6	0.2		78.1	45.1	11.7
	DRYSDALE	10.170	6.5	3.7	0.6		80.2	47.3	12.8
	GILES	10.607	5.1	3.1	1.0		78.4	40.9	11.9
	GLADIUS	9.903	2.1	1.3	0.4		77.2	50.8	13.3
	VENTURA	10.133	6.8	2.1	0.1		79.5	48.5	13.6
	YENDA	11.805	1.0	3.3	0.2		78.1	38.9	12.1
	LSD 5%	1.348	2.0	1.5	0.5		1.4	2.2	0.5

Diseases

The irrigated trials are managed to eliminate any reductions in yield due to diseases. It is important that the disease reactions of varieties and individual farmer ability to manage the disease risks for any variety be taken carefully into consideration. No attempt has been made in this paper to account for the disease reactions of varieties.

In summary, the 2007 irrigated trials in the project "High yielding genotypes of winter cereals for irrigated regions of south east Australia" have shown current varieties can be managed to achieve high yield and high grain quality. In 2008 and 2009 this will assist growers make economic decisions on their use of what water is available for irrigating their crops.

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